

Introduction: Webinar rules

- Webinar rules:
 - The Webinar will start in few minutes
 - You'll be muted all along the Webinar
 - There's a chatting box to ask your questions or send your comments when you want
 - Please address these comments and questions to the user "The REUSE Company" and not to the presenter directly
 - If you have any technical issue please use this chatting box, or mail us at: support@reusecompany.com
 - The Webinar will be recorded. A link to the recording will be sent to you in few days

Managing the quality ecosystem: Rhapsody, Simulink and Modelica



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 TRC WEBINARS 2018

TRC

WEBINARS 2018

- ▶ **Managing the quality ecosystem: Rhapsody, Simulink and Modelica**

Monday, 05 March 2018

Presenters' profile

- ▶ Fabio Di Ninno
 - ▶ Software Engineer



Fabio Di Ninno
fabio.dininno@reusecompany.com



Aerospace and Defense



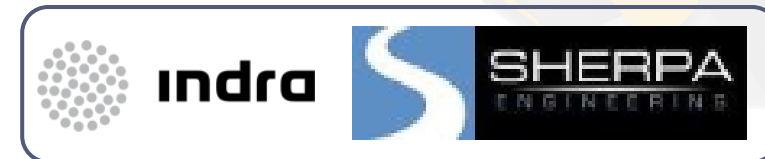
Automotive



Energy



Consulting



Banking



Health care



Other industries



SQA -System Quality Analyzer
Global Quality Management



SIM –System Interoperability Manager

Tailorable Interoperability Platform

- R+ Manager

Managing requirements transformations

Managing models transformations

- T+ Manager

Managing traceability

- Reasoning Manager

Task based environment



**Systems
Knowledge
Repository
(SKR)**



**Systems
Knowledge Base
(SKB)**



**Systems
Assets Store
(SAS)**



RAT –Rich Authoring Tool
Smart text authoring



SKM –System Knowledge Manager
Management of System Knowledge
Libraries

Index

- Introduction: RAT for Rhapsody
- UML\SysML models
 - Create/Edit Rhapsody's requirements in RAT
 - Hyperlinks
 - Patterns with diagram's elements
- Physical models
 - FMU format introduction
 - “Execute requirement” with physical model simulation



Introduction



- **Rich Authoring Tool**
 - Quality analysis on the fly
 - Term Assistant
 - Patterns

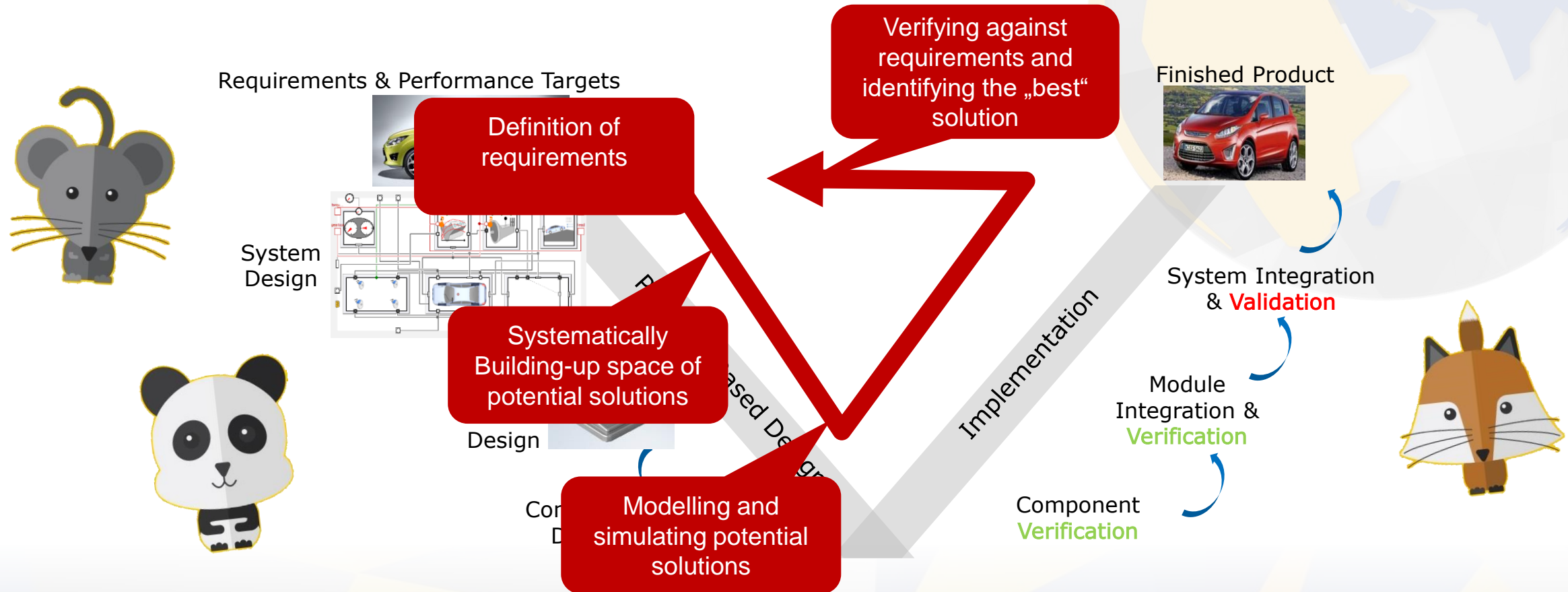


- **IBM Rational Rhapsody**
 - UML/SysML modelling tool



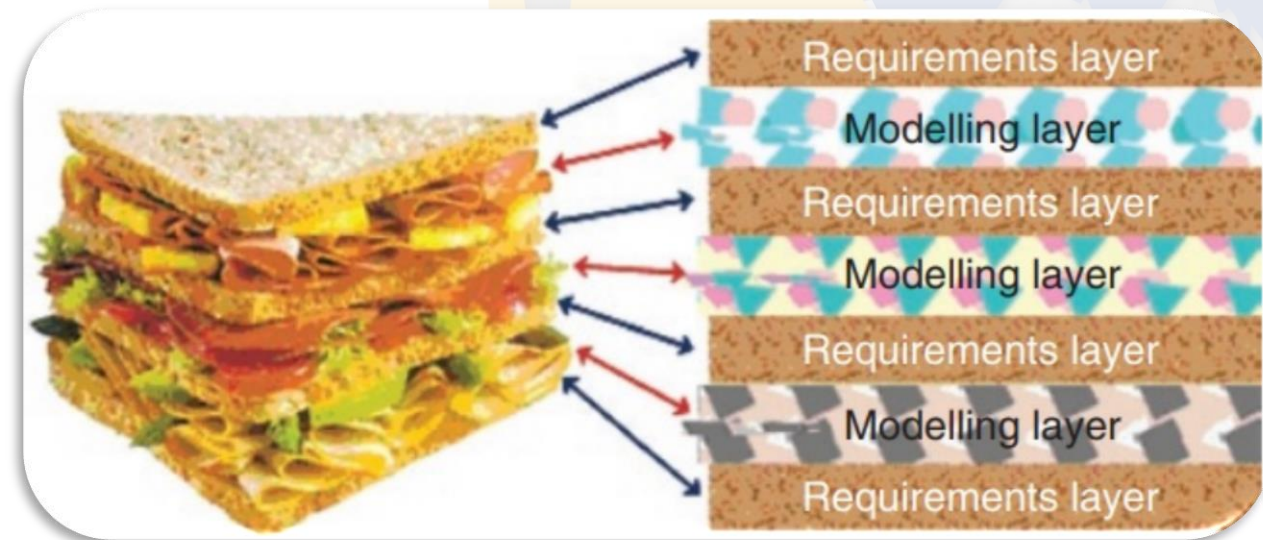
- **Functional Mock-up Unit**
 - Physical Model format for simulation

V - process



RAT & Rhapsody

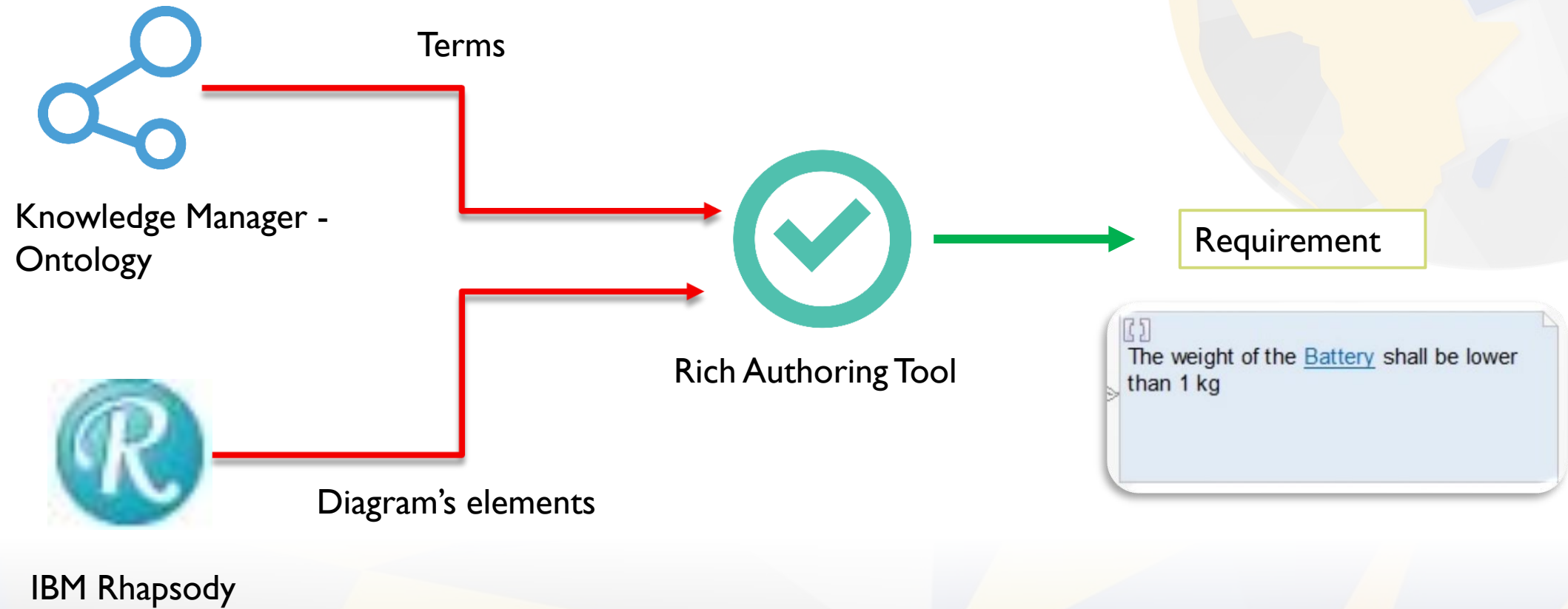
- Why models (diagrams) need requirements?
- “A particular model never says everything about a system.
If it did, it would not be a model”*
- Solution: RAT as plugin on top of Rhapsody



The System Engineering Sandwich

*Dick J, Hull E., Jackson K.(2017)
Requirements Engineering: Edition 4, Springer.

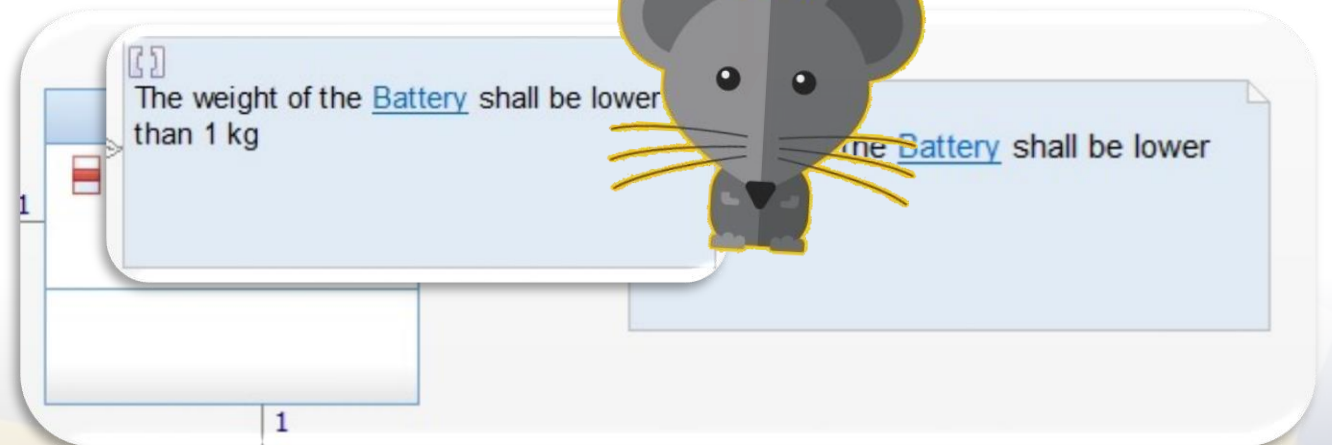
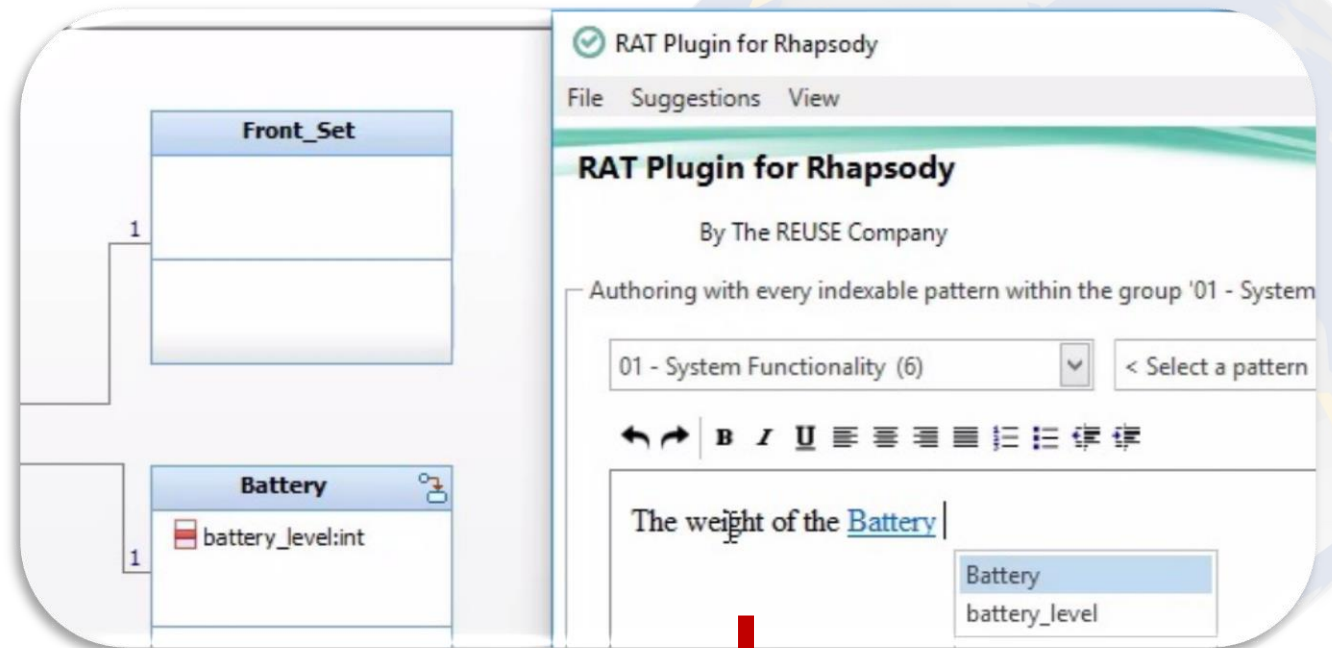
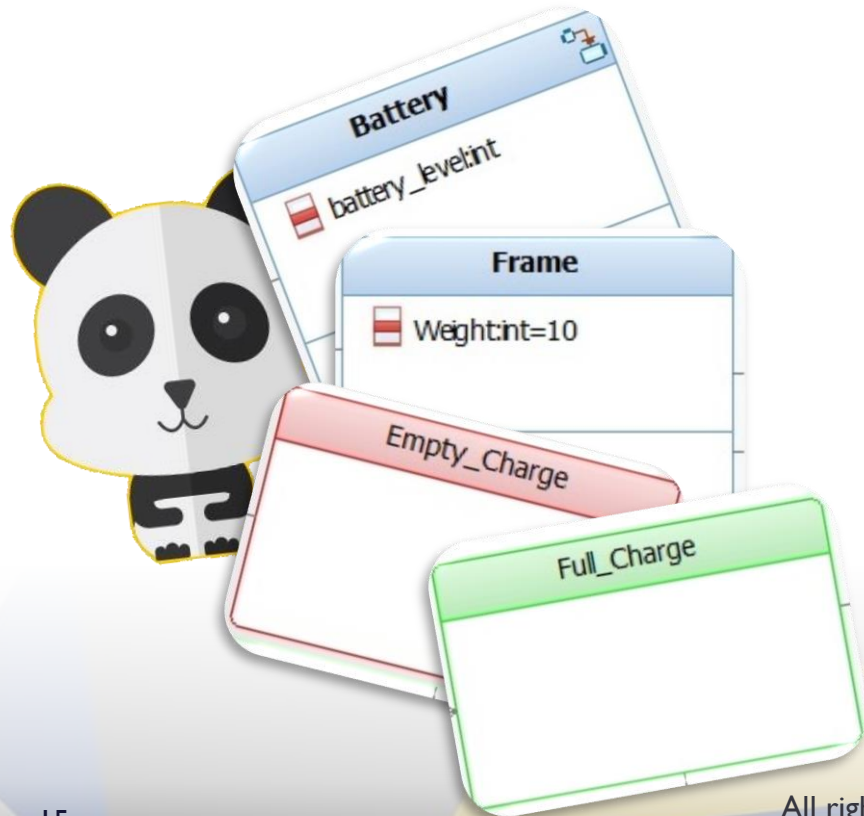
Sources



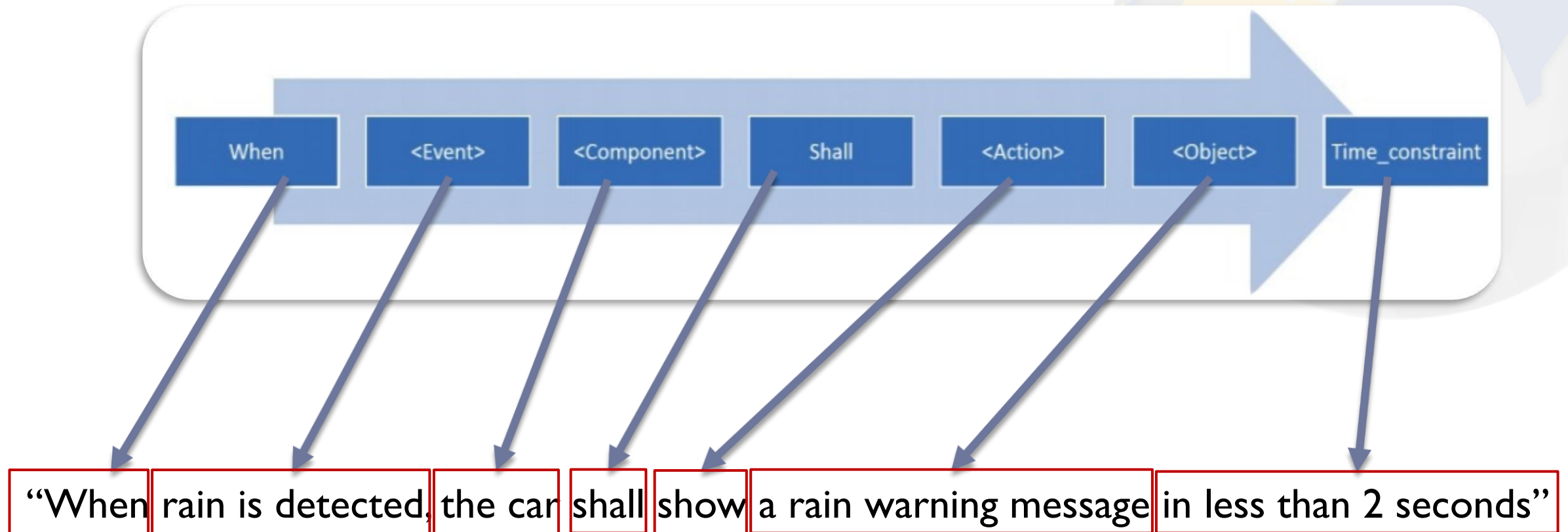
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Hyperlink

- Hyperlink
 - All the elements of the Rhapsody project are imported in imported in RAT



Patterns with Rhapsody Elements

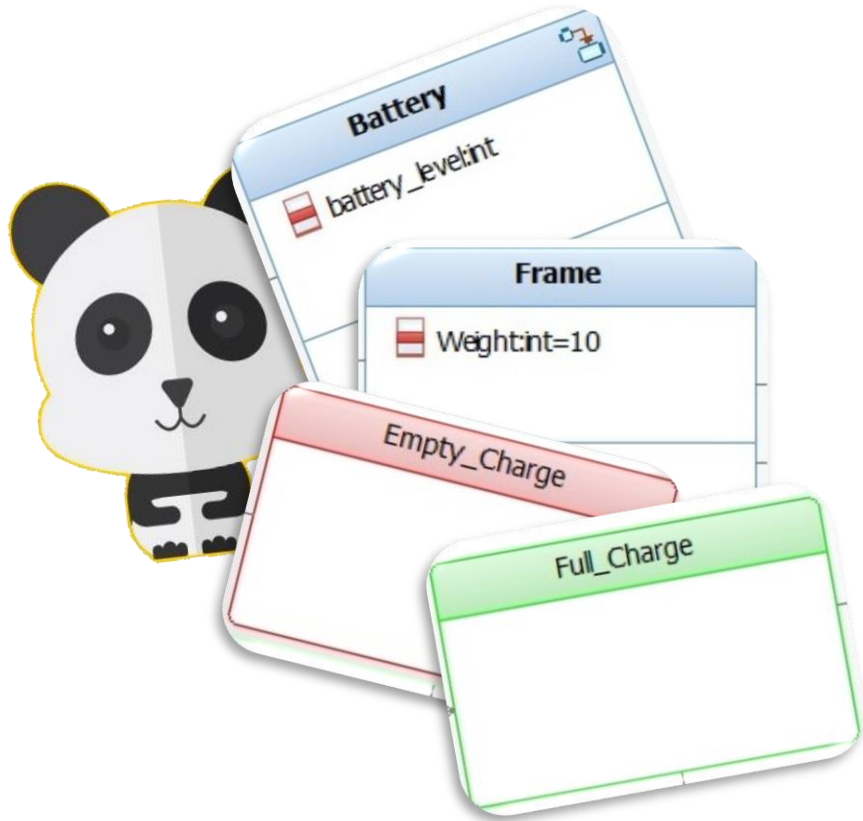


What about the diagram's elements?

Pattern



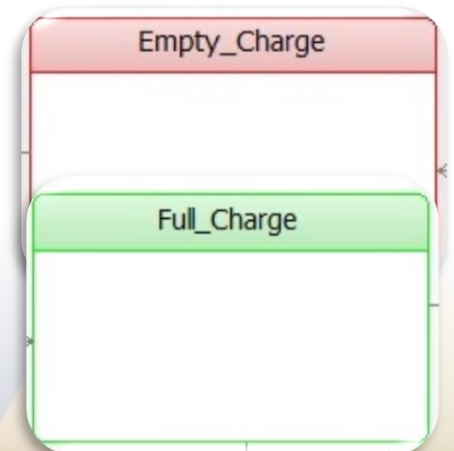
Cluster with name of UML type\SysML Stereotype



Class
Cluster



State
Cluster



IBM Rational Rhapsody Architect for Software (in C++) - [Class Diagram: Bicycle_diagram]

File Edit View Layout Tools Window Help

BasicDefaultComponentDefaultConfigBicycle:usecasediagram_17

Tahoma8

usecasediagram_17BatteryBicycle_diagramModel1Welcome to Rhapsody

Entire Model View

Bicycle

Components

Dependencies

Object Model Diagrams

Packages

Bicycle

Actors

Class Diagrams

Classes

Battery

Display

Electric_Motor

Frame

Front_Set

Power_Control

Saddle_Area

Wheel

Use Case Diagrams

usecasediagram_17

Use Cases

Default

PredefinedTypes (REF)

PredefinedTypesCpp (REF)

Settings

Saddle_Area

Color

1

Frame

Weight

1

Front_Set

1

Display

1

Battery

Battery_level

1

Power_Control

Low_consumption

1

Electric_Motor

1

Wheel

2

Diagram Tools

Class

Package

Port

Generalization

Association

Directed Associati

Aggregation

Composition

Dependency

Flow

Realization

Interface

Actor

Common

Log

Check Model

Build

Configuration Management

Animation

For Help, press F1

Type here to search

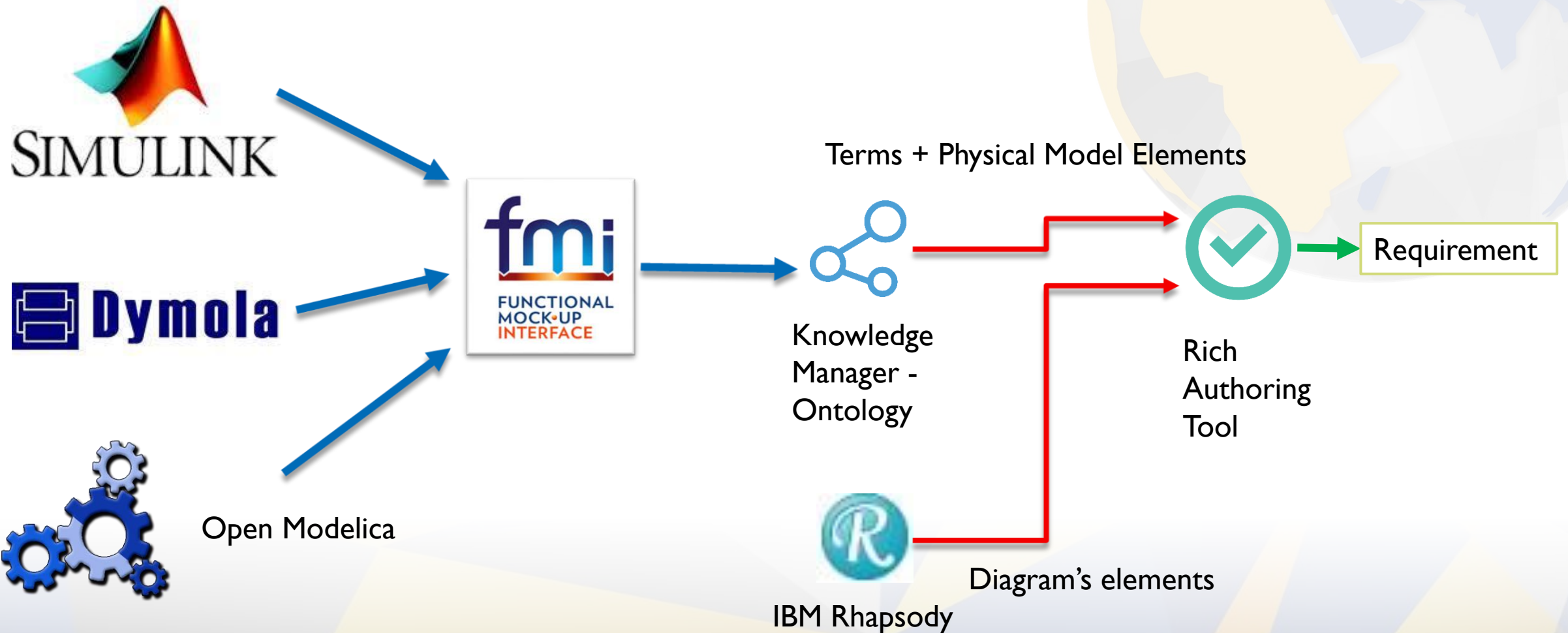
Labels On Fri, 16, Feb 2018 1:40 PM

13:40

16/02/2018

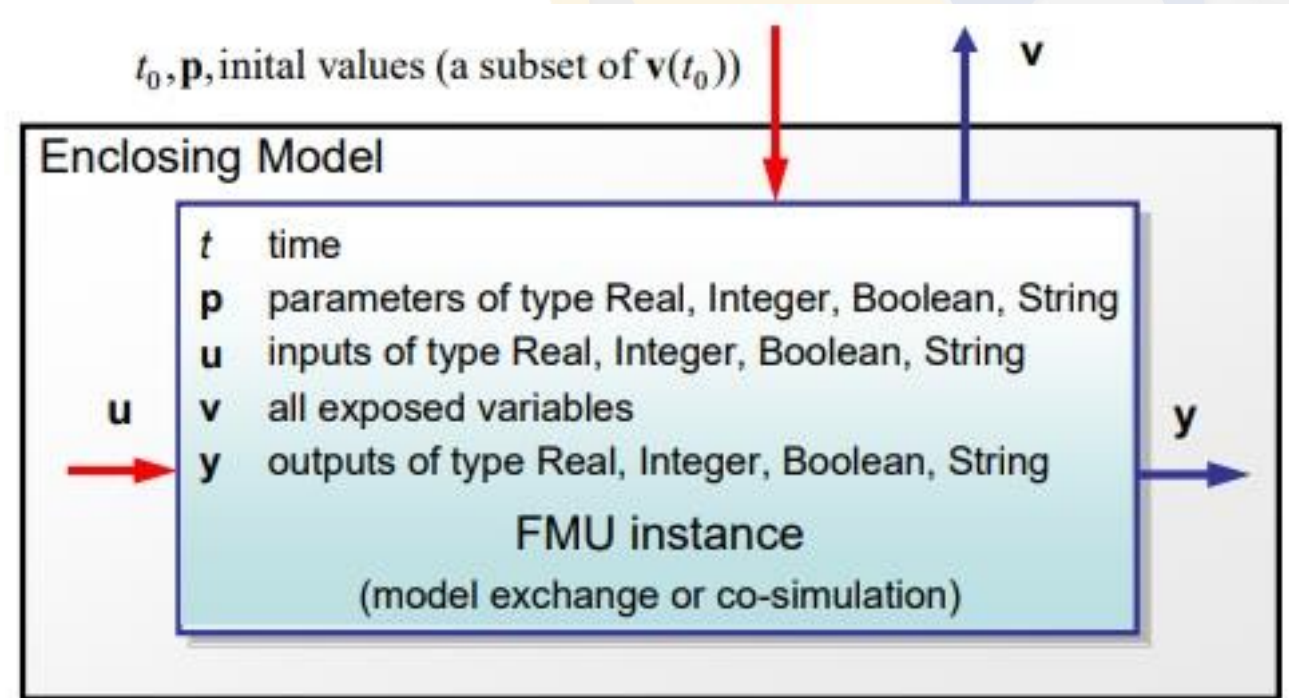
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Total number of total terms: 55 in: 00:00:00.1035306 seconds
LOG 3 OnMenuItemSelect
---- RAT Smart Authoring\Edit selected Workproduct - Description
LOG JAVA: Open RAT Editor Description SENT
Total number of total terms: 55 in: 00:00:00.1118223 seconds

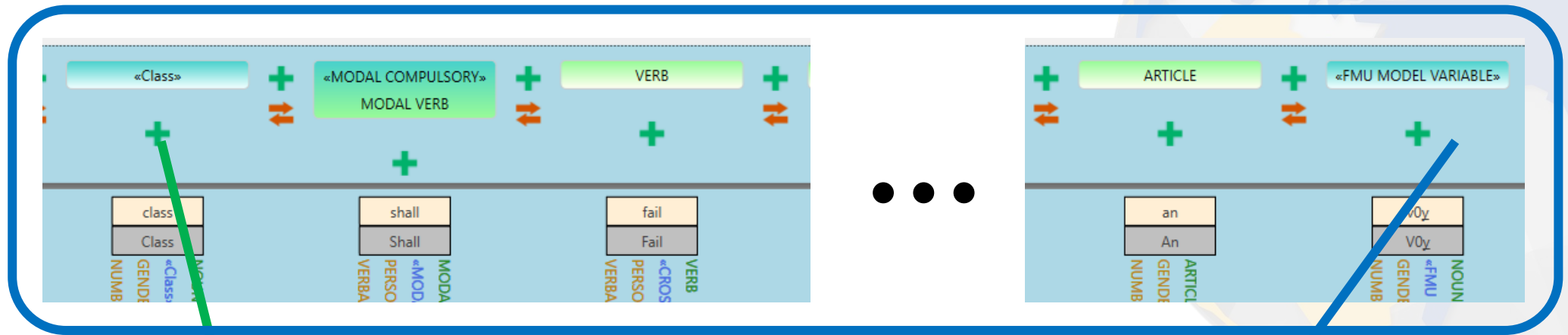
Sources



Physical Models - Functional Mockup Unit (FMU) format

- Black box (zip file) from a Physical Modelling Tool
- Two parts:
 - Description about input and output (xml)
 - Simulation (code)





The Rocket shall reach a high of 300 m , starting from an initial_high of 50 m .

OMEdit - OpenModelica Connection Editor

File Edit View Simulation FMI Export Debug Tools Help

Libraries Browser

Filter Classes

Libraries

- OpenModelica
- ModelicaReference
- ModelicaByExample
- ModelicaServices
- Complex
- Modelica
- Modelica_Requirements
- Rocket1

Rocket1

Writeable Model Text View Rocket1 C:/Users/fabio.dinunno/Desktop/Rocket1.mo Line: 16, Col: 5

```
1 model Rocket1
2   constant Real g = 9.81;
3   //Real x(start = 1);
4   Real y(start = 1);
5   //Real v0_x;
6   Real v0_y;
7
8   parameter Real initial_velocity = 100;
9   parameter Real initial_launch_angle = 45;
10  //parameter Real x0 = 0;
11  parameter Real initial_high = 0;
12  equation
13    //v0_x = v_module * cos(alpha * 0.01745329252);
14    v0_y = initial_velocity * sin(initial_launch_angle *
15      0.01745329252);
16    //x = x0 + v0_x * time;
17    y = initial_high + v0_y * time - 0.5 * g * time ^ 2;
18  end Rocket1;
19
```

Messages Browser

Defaulting to 7-bit ASCII with unknown characters replaced by '?'.
To change encoding when loading a file: loadFile(encoding="ISO-XXXX-YY").
To change it in a package: add a file package.encoding at the top-level.
Note: The Modelica Language Specification only allows files encoded in UTF-8.

[5] 14:35:13 Syntax Warning
[C:/Users/fabio.dinunno/Desktop/Modelica_Requirements/Examples/AircraftRequirements/MaximumCabinTemperatureIncrease.mo:
23:34-23:106]: The file was not encoded in UTF-8:
" <html> <p> This example demonstrates the modeling and verification of ...".
Defaulting to 7-bit ASCII with unknown characters replaced by '?'.
To change encoding when loading a file: loadFile(encoding="ISO-XXXX-YY").
To change it in a package: add a file package.encoding at the top-level.
Note: The Modelica Language Specification only allows files encoded in UTF-8.

IBM Rational Rhapsody Architect for Software (in C++) - [Class Diagram: Rocket_ClassDiagram *]

File Edit View Layout Tools Window Help

Basic

DefaultComponent

DefaultConfig

Rocket::Rocket_ClassDiagram

Entire Model View

Rocket

- Components
 - DefaultComponent
 - Dependencies
 - «AppliedProfile» CodeCentricCp
- Object Model Diagrams
 - Packages
 - Default
 - PredefinedTypes (REF)
 - PredefinedTypesCpp (REF)
 - Class Diagrams
 - Rocket_ClassDiagram
 - Classes
 - Rocket
 - Requirements
 - Settings

Rocket_ClassDiagram * Model1 * Welcome to Rhapsody

Rocket

initial_velocity = 150

Select

Stamp Mode

Diagram Tools

- Class
- Package
- Port
- Generalization
- Association
- Directed Associati
- Aggregation
- Composition
- Dependency
- Flow
- Realization
- Interface
- Actor

Common

- Note
- Constraint
- Comment
- Requirement
- Anchor

X: -95.73 Y: 105.51

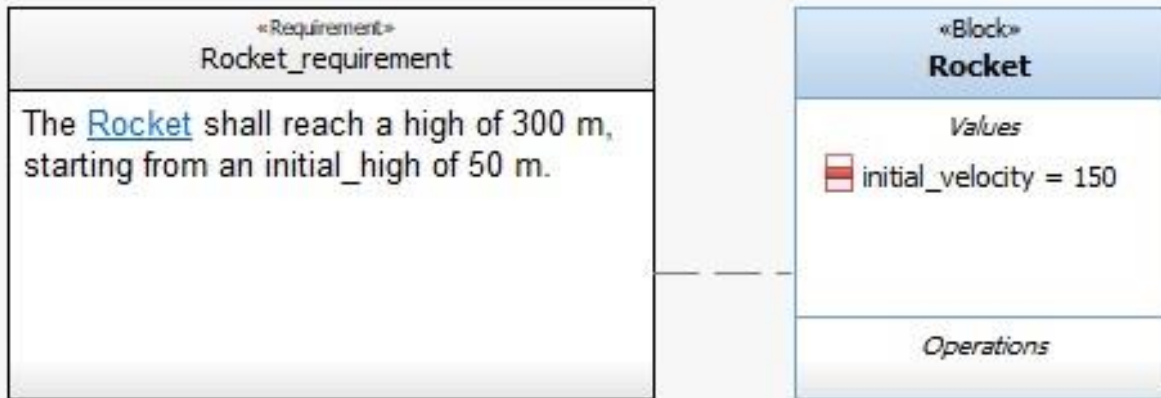
Welcome Modeling Plotting Debugging

For Help, press F1

Labels On Fri, 16, Feb 2018 2:39 PM

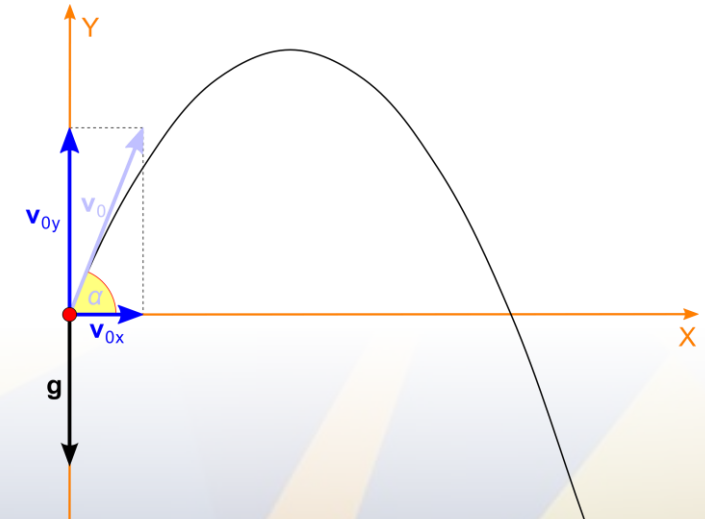
Example – Rocket

- Diagram:
- Requirement
- Block: Rocket



- Physical Model

- Variables:
- Initial high
- Initial launch angle
- Initial velocity
- y



How it works?

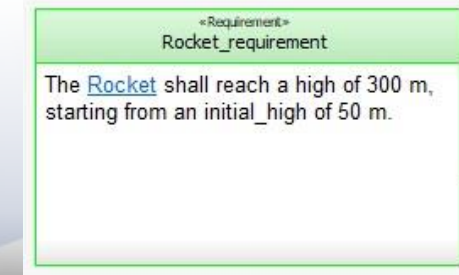
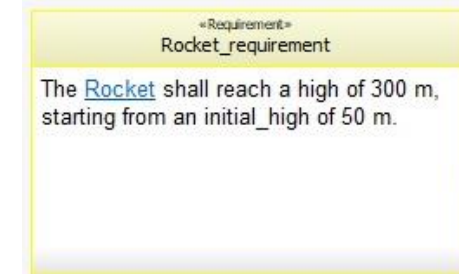
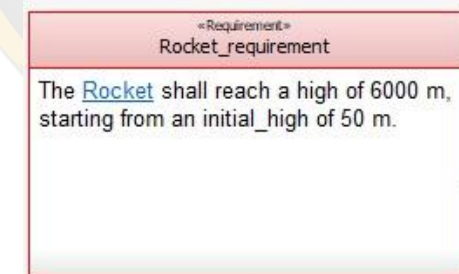
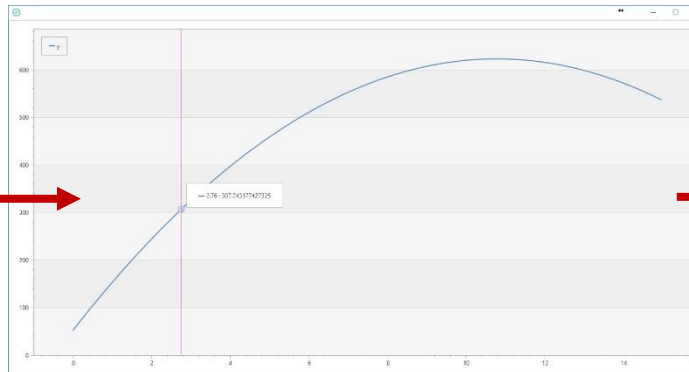
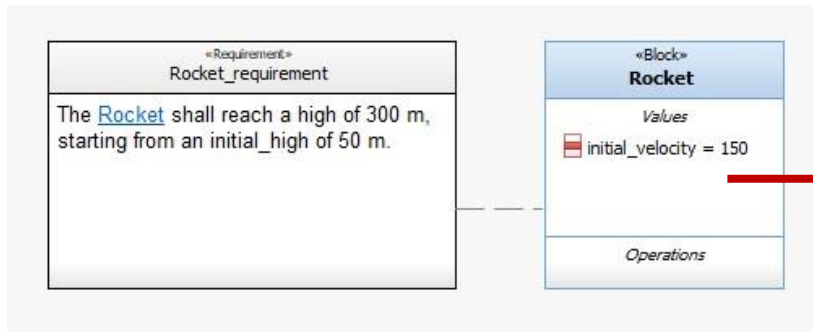
> Input

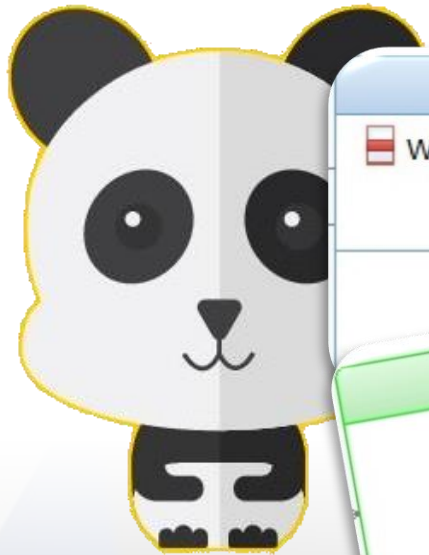
- > Requirement
- > Diagram's elements
- > On the fly


> Simulation of the physical model

> Output

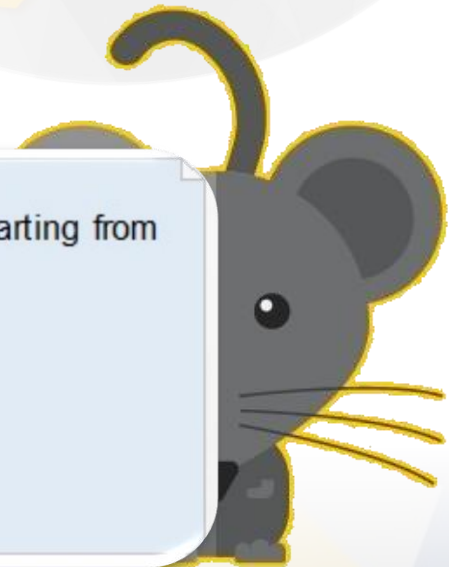
- > Feasibility of the requirement





 The [Rocket](#) shall reach a height of 300m, starting from an initial_high of 50 m.

h a height of 300m, starting from







Next webinar

- **Topic:** Assessing Requirements Quality against Logical and Physical models (in Rhapsody and Simulink) and Ontologies in Protégé
- **Content:**
In the world of **Model-Based Systems Engineering**, we usually find a huge ecosystem full of tools. The community of practitioners will be using a wide variety of different tools for **Requirements Management, Logical and Physical Modelling, Traceability, Simulation, Quality Management.**
- **Dates:**
 - Tuesday 13th MAR 2018 at 5.00 pm CET
 - Thursday 15th MAR 2018 at 9.00 am CET

WEBINAR ID	NAME	DATES	TIME
TRCW-01	Requirements Quality along the supply chain	16/01/2018 18/01/2018	5.00 pm CET 9.00 am CET
TRCW-02	Managing the quality ecosystem: DOORS, Rhapsody, Simulink and Modelica	20/02/2018 22/02/2018	5.00 pm CET 9.00 am CET
TRCW-03	Assessing Requirements Quality against Logical and Physical models (in Rhapsody and Simulink) and Ontologies in Protégé	13/03/2018 15/03/2018	5.00 pm CET 9.00 am CET
TRCW-04	Procuring systems: PQS for SMARTer acquisition	03/04/2018 05/04/2018	5.00 pm CET 9.00 am CET
TRCW-05	Tracing system work products: T+ Manager	08/05/2018 10/05/2018	5.00 pm CET 9.00 am CET
TRCW-06	Knowledge and Quality management milestones in a SE organization	05/06/2018 07/06/2018	5.00 pm CET 9.00 am CET
TRCW-07	Automatic checking of quality metrics for logical and physical models	11/09/2018 13/09/2018	5.00 pm CET 9.00 am CET
TRCW-08	Requirements Transformations	16/10/2018 18/10/2018	5.00 pm CET 9.00 am CET
TRCW-09	Following standards patterns in KCSE: An application to EARS patterns in RAT and SKM	03/07/2018 05/07/2018	5.00 pm CET 9.00 am CET
TRCW-10	Defining your own quality rules in KCSE: A one-hour practical approach	06/11/2018 08/11/2018	5.00 pm CET 9.00 am CET
TRCW-11	The KCSE approach in a nutshell	11/12/2018 13/12/2018	5.00 pm CET 9.00 am CET





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